



Detailed Design

SEA CHANGE Data analysis Solution

Devices Metadata

Version 1.0

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Revision History

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1 Introduction

1.1 Scope

This document outlines the metadata of the devices located at Portsmouth International Port (PIP).

2 Devices' location:

2.1 Location table:

The table below lists the locations of devices in Portsmouth Port.

Device ID	Location	Latitude	Longitude
1D95D8	Berth 5	50.8136430	-1.0928250
1D8BC5	MEGCP	50.8106950	-1.0875830
1D92BC	SG	50.8123330	-1.0866120
18E141	Berth 4	50.8112080	-1.0968130
1D1CF5	Berth 2	50.8113134	-1.0945468

Table 1:location

3 Type of devices:

3.1 Device types:

The table below shows each device and its type.

Device ID	Type
1D95D8	A
1D8BC5	B
1D92BC	A
18E141	C
1D1CF5	A

Table 2: types

3.2 Type A description:

These types of sensors only send data related to particulate matter, CO2, humidity, and temperature.

Column	Description	Unit
DeviceID	The Id of the device	-
Timestamp	The time the message containing particulate matters data was sent	Datetime
msgType	Message type: 1 indicates data related to particulate matters only	-
scdCO2	Carbon dioxide concentration	parts per million
pm_1	particulate matters smaller than 1 micron	microgram per cubic metre
pm_10	particulate matters smaller than 10 microns	microgram per cubic metre
pm_25	particulate matters smaller than 2.5 microns	microgram per cubic metre
scdTemp	Temperature	degrees Celsius
scdHumidity	Humidity	percentage

Table 3: type A

3.3 Type B description:

These types of sensors send both messages containing data related to particulate matters (msgType=1) and pollutants (msgType=2).

Column	Description	Unit
DeviceID	The Id of the device	-
Timestamp	The time the message containing particulate matters or pollutant data was sent	Datetime
NO2	Nitrogen Dioxide	parts per billion
SO2	Sulphur dioxide	parts per billion
NO	nitric oxide	parts per billion
pm_1	particulate matters smaller than 1 micron	microgram per cubic metre
pm_10	particulate matters smaller than 10 microns	microgram per cubic metre
pm_25	particulate matters smaller than 2.5 microns	microgram per cubic metre
AfeTEMP	Temperature	degrees Celsius

Table 4: type B

3.4 Type C description:

These types of sensors not only send both messages containing data related to particulate matters (msgType=1) and pollutants (msgType=2), but also send the average number of ships.

Column	Description	Unit
DeviceID	The Id of the device	-
Timestamp	The time the message containing particulate matters or pollutant data was sent	Datetime
NO2	Nitrogen Dioxide	parts per billion
SO2	Sulphur dioxide	parts per billion
NO	nitric oxide	parts per billion
pm_1	particulate matters smaller than 1 micron	microgram per cubic metre
pm_10	particulate matters smaller than 10 microns	microgram per cubic metre
pm_25	particulate matters smaller than 2.5 microns	microgram per cubic metre
AfeTEMP	Temperature	degrees Celsius
shipCount	The number of ships within the PIP geo-fence, within the last 2 hours ¹	Number

Table 5: type C

4 Message frequency:

Type A devices transmit data messages every 15 minutes, containing PMs² data, as previously mentioned.

On the other hand, Type B and C devices also transmit messages every 15 minutes, alternating between data on PMs and gases³. Type C devices additionally provide the count of ships alongside gas data. Consequently, for these devices, the interval between two consecutive gas or PMs messages extends to 30 minutes.

¹ Each time a new ship MMSI number enters the geo-fence it is added and removed when it leaves

² PMs means PM1, PM10, PM2.5

³ Gases include NO2, SO2, NO

5 Modifying Gases values:

5.1 Modifying gases value:

Replacing values less than 15 ppb for NO₂, SO₂, and NO with zeros is recommended, as the gases ppb algorithm is not accurate for very low quantities.

5.2 Adjusting SO₂ values:

The cross-sensitivity value for SO₂ gas is adversely reduced in the presence of NO₂ so SO₂ needs to be increased according to its value proportionately with the value NO₂ as per the following:

$$SO_2 = SO_2 + (NO_2 * 1.2)/5$$